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Co-operative Health Information Networks „CHIN"

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Abstract. This paper describes the „CHIN" initiative[9] which is to establish regional **Co-operative Health Information Networks** in **eight** representative **European regions**, both rural and metropolitan. The CHINs provide comprehensive and integrated sets of Health Care Telematic - and Information Services supporting distributed working scenarios between primary and secondary care institutions, social and administrative units and offer on-line information resources for education and training. Technically a set of basic and specific telematic services is being implemented based on a modular and standardised client-server platform which will allow both the support of various regional telemedicine applications as well as inter-regional services. The information exchange is centered around a Meta-EPR, is compliant with international standards (HL7, DICOM/MEDICOM, EDI) and incorporates appropriate security mechanisms.

1. State of the Art and Motivation

Analysing the existing communication and co-operation scenarios between major actors in health care and the way these scenarios are technically supported today there is no doubt that health telematics provides an effective solution to cope with the challenge of delivering improved healthcare services more cost effectively. To illustrate the magnitude of current communication streams in healthcare Fig. 1 shows as an example the most important information flows in Germany, indicated by arrows, and the number of transactions per year , indicated by the accompanying figure. The figures within the circles indicate the number of institutions. The communications cover three principal types of information: patient data, administrative data and scientific and educational data, which have to follow different standards and security requirements. Despite the progress in information technology most of the transactions shown are still performed via mail, courier and fax and local applications are rarely integrated in communication systems. It is easy to imagine what huge impact which a user controlled, electronic handling of this information can have on the healthcare domain. The IT-systems for medical users, developed and presented during the last few years and in particular as a result of the FW3 program of the EU, AIM/ENS [1], can support nearly all of communication scenarios indicated in Fig. 1. However, although many systems represent sophisticated and advanced solutions most of them lack **visibility** and **accessibility** (who knows about the systems outside the group of developers ?) and, even more importantly, **reliability** and **integration** - because a demonstrator is not a "product.

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The main conclusions to be drawn from this are:

- move from „hand-made systems" to standardised, modular systems of industrial quality, support and appropriate marketing,
- organise the community of users to enable the operation of distributed and interdisciplinary healthcare information systems,
- provide reliable bussines case data.

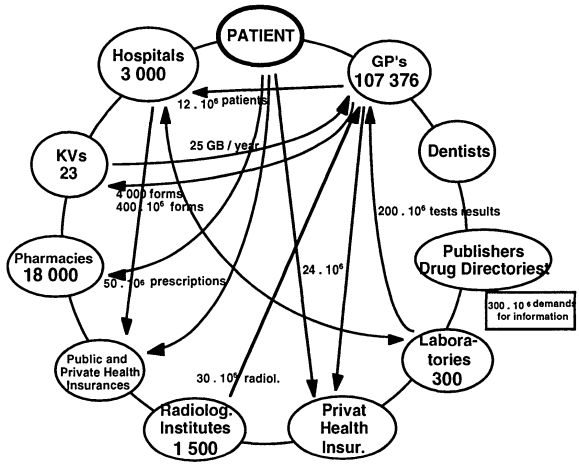

Fig. 1: Important Communication Scenarios between Healthcare Sectors

2. The Organisational Approach of CHIN

When preparing the CHIN initiative the above issues were seriously taken into consideration. Consequently, as a first activity, large representative user communities have been brought together, their needs analysed. The focus of that investigation was on the practical information needs of patients, the primary - and social care levels in the context of the healthcare domain [2]. Secondly, the industrial quality of systems required the involvement of appropriate industrial partners both on the side of suppliers of end systems as well as telecommunications infrastructures and services. The consortium of the CHIN initiative is supported by leading producers of information technology for the health market, leading providers of telecommunication services in Europe side by side with large user organisations and administrations responsible for the delivery of health care services in eight European regions. The regions cover, to name just a few examples, metropolitan areas such as Berlin and Brussels and remote and rural areas such as Norrland, Sweden, which covers nearly 50% of the Swedish territory.

3. The Technical and Service Concept

Technically, CHIN is based on the client / server concept as many other systems nowadays. Each region operates initially at least one powerful CHIN server. This server provides on the regional level ISDN connections to a set of different types of CHIN clients and supports a number of region specific services, such as resource and service directories, patient management information, electronic patient record management and/or information on public

health issues, depending on the region´s specific needs. This service provision is based on the following set of scalable core CHIN server functions:

- Secure Web Server as access point,
- HTML/HTTP as generic language /communication protocol,
- HL7, EDIFACT, DICOM/MEDICOM as standard document formats,
- Interfaces to Information Systems (Administrative and Medical),
- ISDN Server,
- Meta Patient Record server for secure remote access and import of MM documents.

These core functions are common to most CHIN servers, although the region specific services as well as the technical environment in each region may be different.
The regional communication is based on ISDN (POTS access will be possible, although not favoured) and uses the IP-private address space, i.e. Intranet technology. Via this channel modular, scalable CHIN-clients are interconnected to the server and outside world. The PC-based client modules support a set of basic telematic services: desk top video-conferencing, WWW, mail, ftp and application sharing. These basic services, embedded in a secure environment are enhanced by specific tools for integration and viewing to meet the specific medical application requirements. The main concepts for the clients are:

- PCs as main platform,
- Secure Web browser,
- Medical Image Viewer,
- Lab Result Viewer,
- VC system with shared space,
- Scanner and/or Camera for import of analogue documents and
- Meta Patient Record Interface.

The information systems are centered around an electronic patient record integration platform, the Meta-Patient-Record, which is based on sHTML/sHTTP. This approach supports the communication of various types of patient related information stored in different formats and distributed over heterogeneous systems. The priniciple is illustrated in Fig.3.

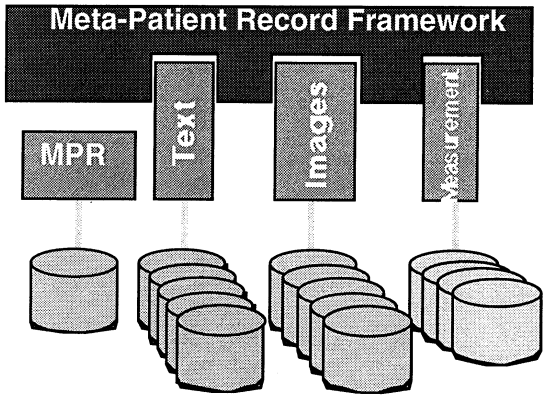

Fig. 2: The Meta-Patient-Record (MPR) Concept

The CHIN MPR-server keeps references of information including its locations. For an authorised user, who may be located inside or outside the hospital, information can be displayed in form of an HTML document, listing for example all patients of that particular doctor. The doctor selects a patient and receives a list of documents which the doctor can select from. According to the individual preferences images are displayed either by name or token-images. These images, reduced in size, allow a precise preselection of documents without demanding too much bandwidths of communication channels. If documents are not stored in a standard format, the CHIN server supports the conversion in HL7 or DICOM files which can be displayed like a usual HTML multimedia document simply by activating the specific medical HTML viewers for image- and lab-data, Fig.4a and 4b.

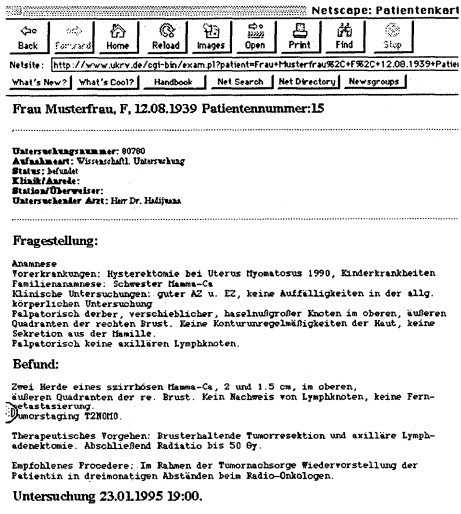

Fig. 3a: Example of an MPR with tual Textual Information

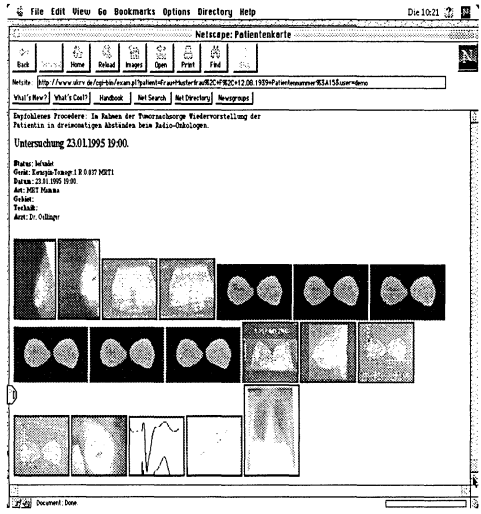

Fig. 3b: MPR with Token Images of Different Origin

Hence, the HTML Meta Patient Record reference functions as the integration platform for a variety of medical data. It separates the medical information from specific predefined data models of specific Database Management Systems and their implementations and allows a user to display exactly and easily the information the user is looking for. As HTML browsers are cheap, supported by industry and available on nearly every platform, the problems of openness, interconnectivity and data integration are practically solved.

How the overall concept is taken up by the various clients in a CHIN-region is shown in Fig.5, in conjunction with the inter-regional and regional server functions. On an inter-regional level the CHIN servers are interconnected on the basis of IP and this communication mainly covers non-patient related data such as information for education and requests and results of intelligent information retrieval services. While the MPR approach has been developed out of a clinical perspective the method will be used to integrate all three classes of information (EPR, admin. data, knowledge) leading to comprehensive, customizable and flexible multimedia health information systems where regional and inter-regional data resources can be easily linked as required[4] . The boundaries are practically invisible and basically determined by security constraints.

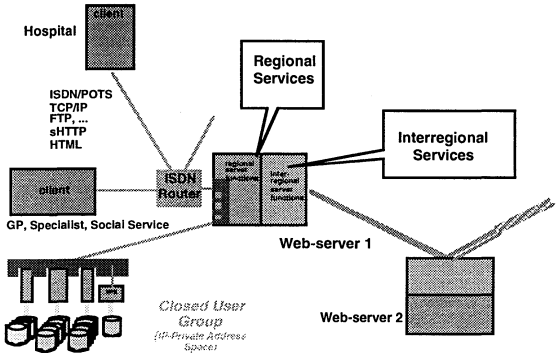

Fig. 4: Interaction of Clients and Servers

4. Conclusions and Perspectives

The sHTML/sHTTP integration concept for integrating different types of medical information on the basis of a small set of internationally accepted medical file formats shows a new way to electronic communications within the medical domain [5]. Embedded in appropriate security mechanisms and implemented on an open HW/SW platform (which has to take into account the real economic constraints and needs of users) it allows any authorised actor in the HC-domain to benefit. The co-operative structures in CHIN, in particular the emerging regional ones, have the chance to take up the CHIN components, contributed by individual project teams, and to build the regional organisational backbones for multidisciplinary healthcare information services.

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